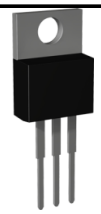
SCT2120AF

N-channel SiC power MOSFET Data Sheet

V_{DSS}	650V
$R_{DS(on)}$ (Typ.)	120mΩ
I_D	29A
P_D	165W

●Outline

TO220AB

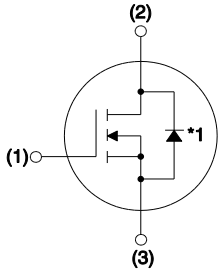


(1) (2) (3)

●Features

1) Low on-resistance
2) Fast switching speed
3) Fast reverse recovery
4) Easy to parallel
5) Simple to drive
6) Pb-free lead plating ; RoHS compliant

●Inner circuit



(1) Gate
(2) Drain
(3) Source

*1 Body Diode

●Application

・Solar inverters
・DC/DC converters
・Switch mode power supplies
・Induction heating
・Motor drives

●Packaging specifications

Type	Packing	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Taping code	-
	Marking	SCT2120AF

●Absolute maximum ratings (T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	650	V
Continuous drain current	T_c = 25°C	I_D *1	29	A
	T_c = 100°C	I_D *1	20	A
Pulsed drain current		$I_{D,pulse}$ *2	72	A
Gate - Source voltage		V_{GSS}	-6 to 22	V
Power dissipation (T_c = 25°C)		P_D	165	W
Junction temperature		T_j	175	°C
Range of storage temperature		T_{stg}	-55 to +175	°C

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	0.70	0.91	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	650	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0V				μA
		T_j = 25°C	-	1	10	
		T_j = 150°C	-	2	-	
Gate - Source leakage current	I_{GSS+}	V_{GS} = +22V, V_{DS} = 0V	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	V_{GS} = -6V, V_{DS} = 0V	-	-	-100	nA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = V_{GS}, I_D = 3.3mA	1.6	-	4.0	V
Static drain - source on - state resistance	$R_{DS(on)}$ *3	V_{GS} = 18V, I_D = 10A				mΩ
		T_j = 25°C	-	120	156	
		T_j = 125°C	-	149	-	
Gate input resistance	R_G	f = 1MHz, open drain	-	13.8	-	Ω

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *3	V_{DS} = 10V, I_D = 10A	-	2.7	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	1200	-	pF
Output capacitance	C_{oss}	V_{DS} = 500V	-	90	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	13	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 300V	-	115	-	pF
Turn - on delay time	$t_{d(on)}$ *3	V_{DD} = 300V, I_D = 10A	-	22	-	ns
Rise time	t_r *3	V_{GS} = 18V/0V	-	31	-	
Turn - off delay time	$t_{d(off)}$ *3	R_L = 30Ω	-	60	-	
Fall time	t_f *3	R_G = 0Ω	-	19	-	
Turn - on switching loss	E_{on} *3	V_{DD} = 300V, I_D=10A V_{GS} = 18V/0V R_G = 0Ω, L=500μH *E_{on} includes diode reverse recovery	-	61	-	μJ
Turn - off switching loss	E_{off} *3		-	41	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *3	V_{DD} = 300V	-	61	-	nC
Gate - Source charge	Q_{gs} *3	I_D = 10A	-	14	-	
Gate - Drain charge	Q_{gd} *3	V_{GS} = 18V	-	21	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} = 300V, I_D = 10A	-	10.4	-	V

*1 Limited only by maximum temperature allowed.

*2 PW ≤ 10μs, Duty cycle ≤ 1%

*3 Pulsed

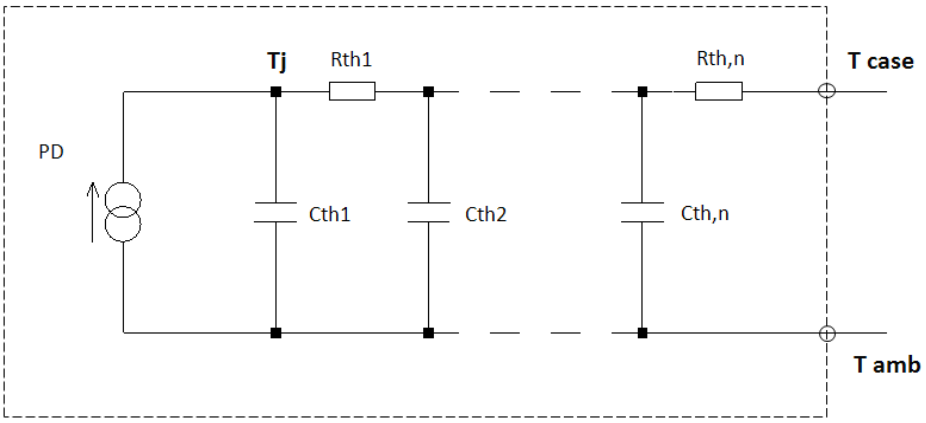
●Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_c = 25°C	-	-	29	A
Inverse diode direct current, pulsed	I_{SM} *2		-	-	72	A
Forward voltage	V_{SD} *3	V_{GS} = 0V, I_S = 10A	-	4.3	-	V
Reverse recovery time	t_{rr} *3	I_F = 10A, V_R = 400V di/dt = 160A/μs	-	33	-	ns
Reverse recovery charge	Q_{rr} *3		-	53	-	nC
Peak reverse recovery current	I_{rrm} *3		-	3.0	-	A

●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R_{th1}	96.1m	K/W
R_{th2}	404m	
R_{th3}	196m	

Symbol	Value	Unit
C_{th1}	1.55m	Ws/K
C_{th2}	5.23m	
C_{th3}	83.3m	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

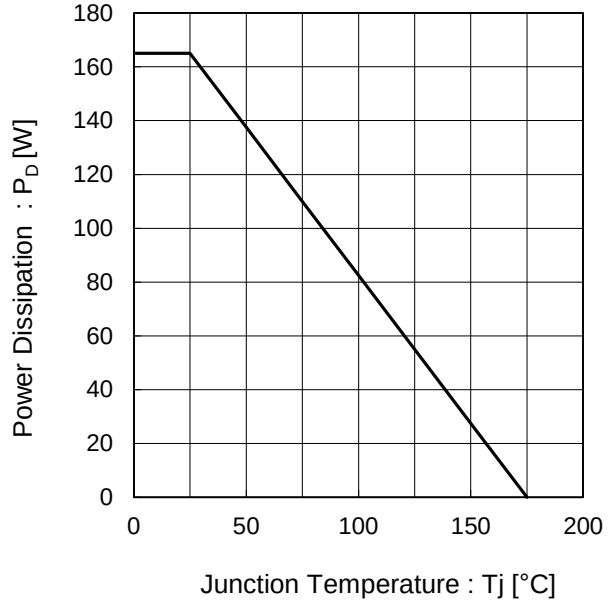


Fig.2 Maximum Safe Operating Area

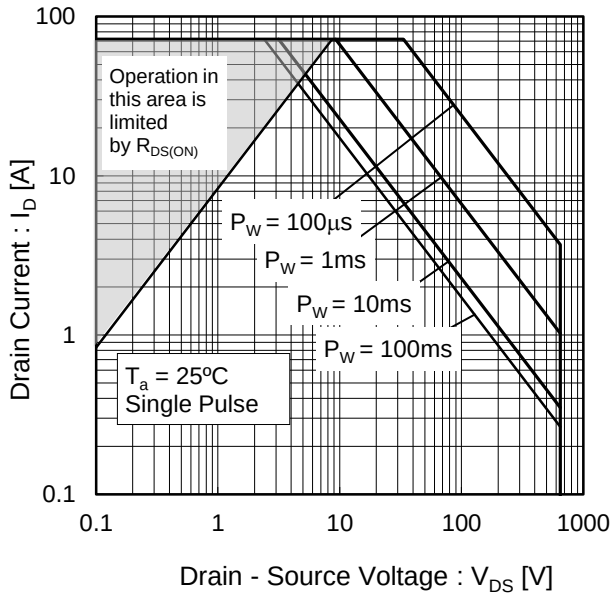
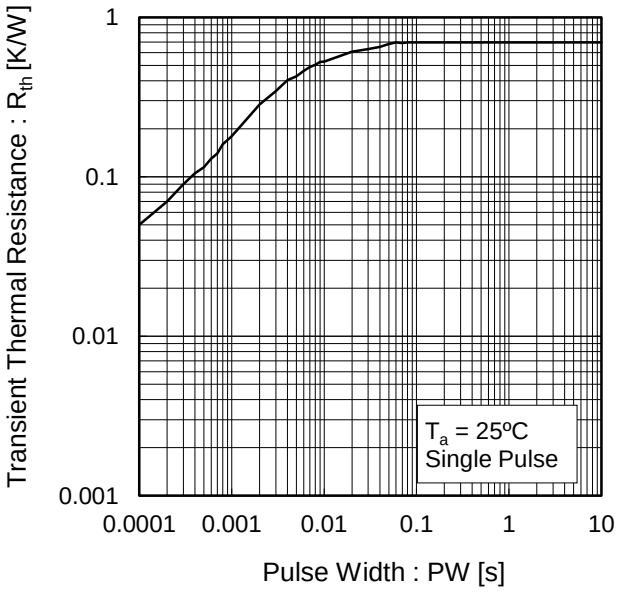


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

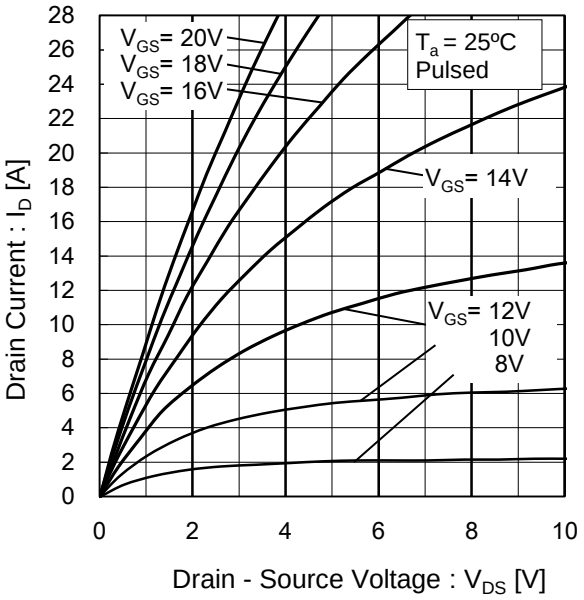


Fig.5 Typical Output Characteristics(II)

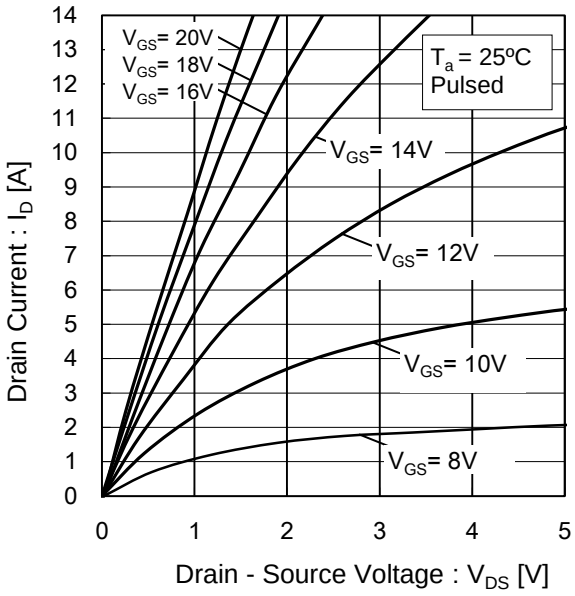


Fig.6 T_j = 150°C Typical Output Characteristics(I)

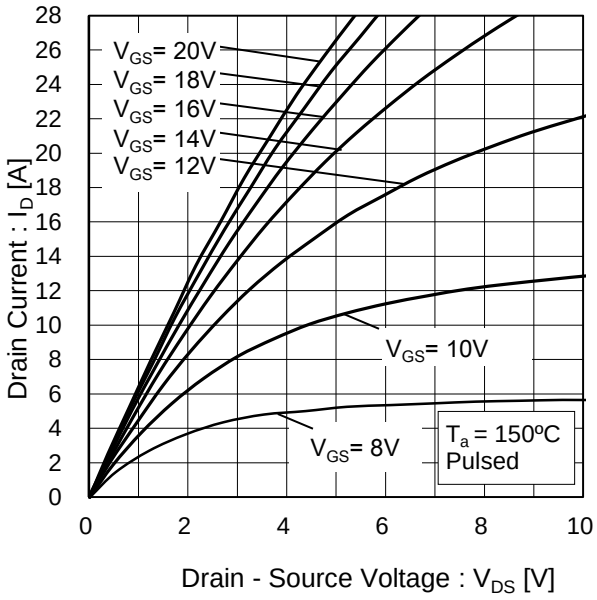
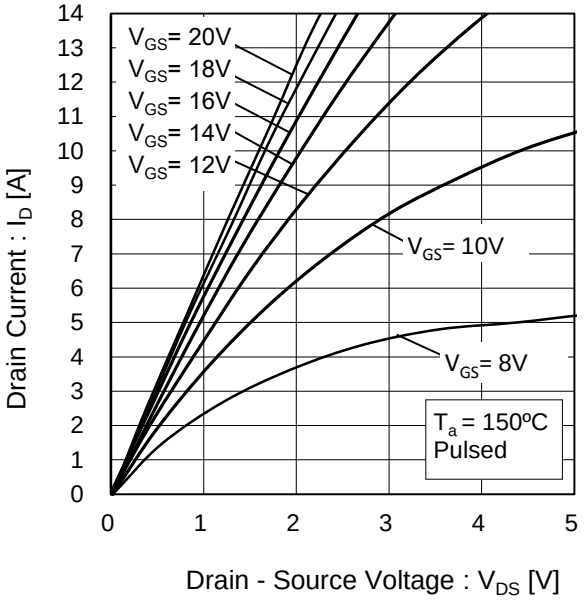


Fig.7 T_j = 150°C Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

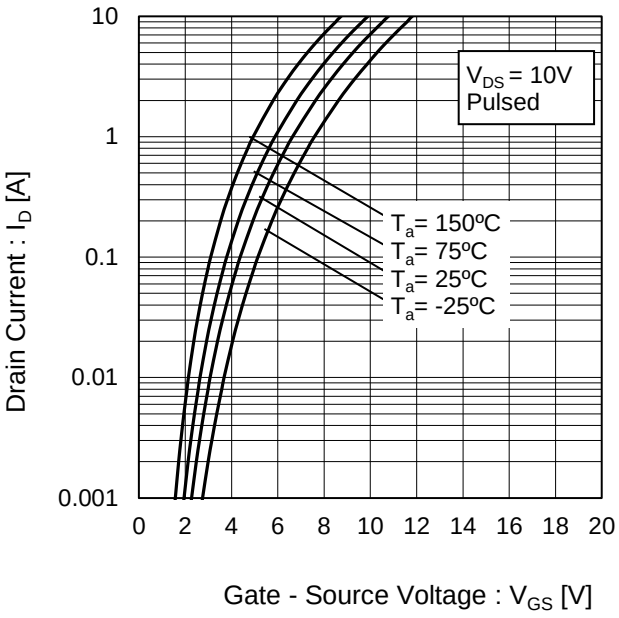


Fig.9 Typical Transfer Characteristics (II)

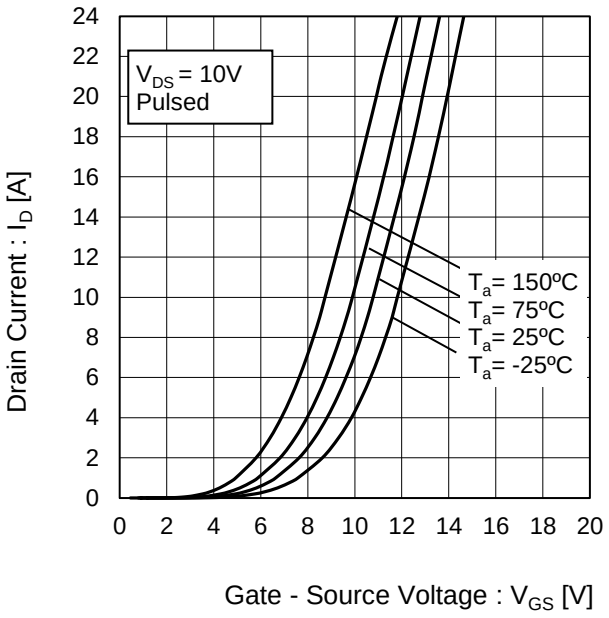


Fig.10 Gate Threshold Voltage vs. Junction Temperature

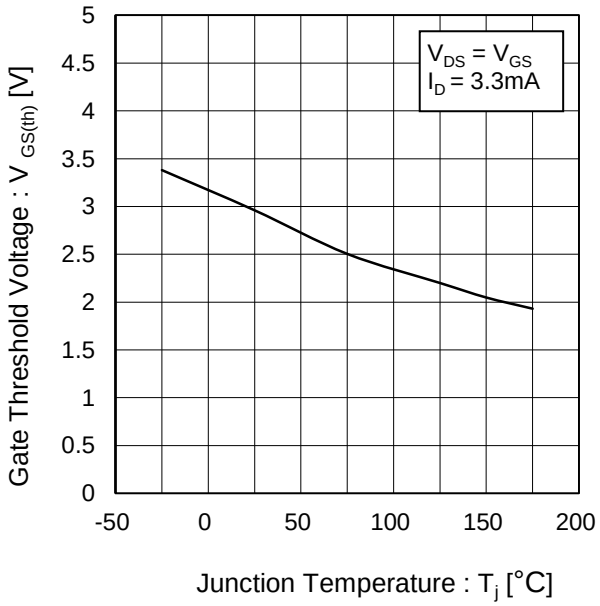
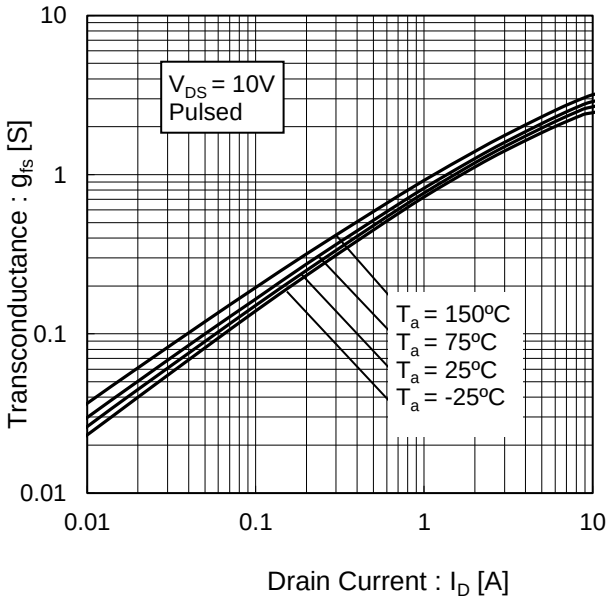


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.12 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

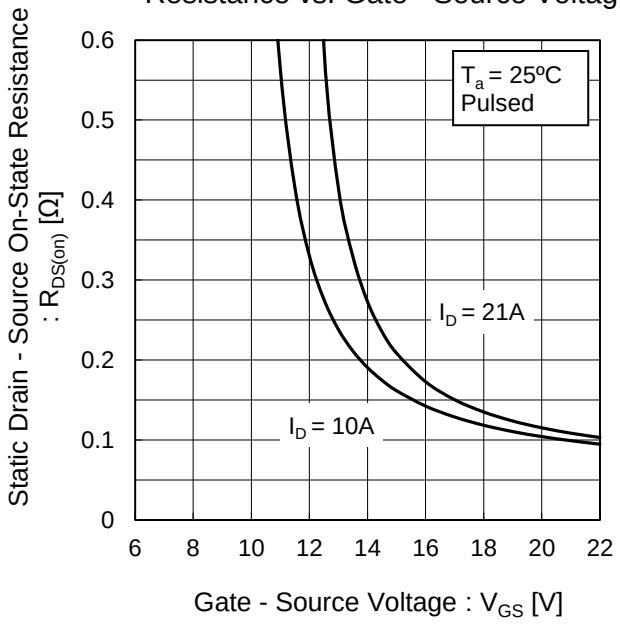


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

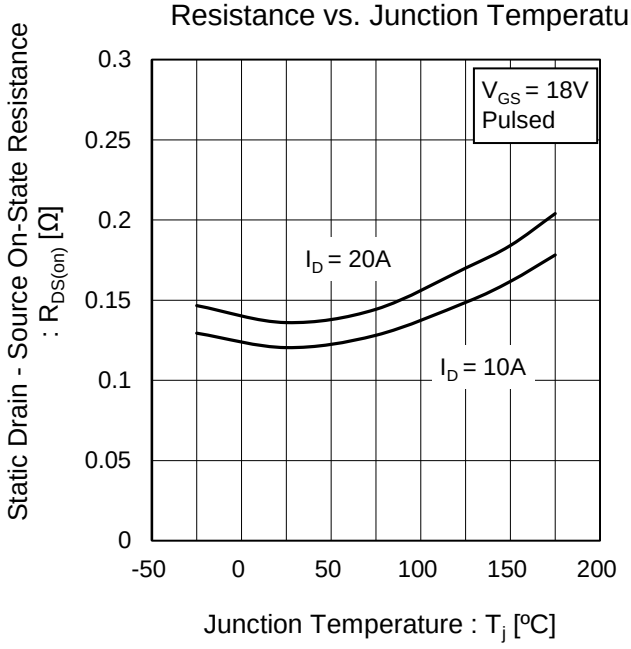
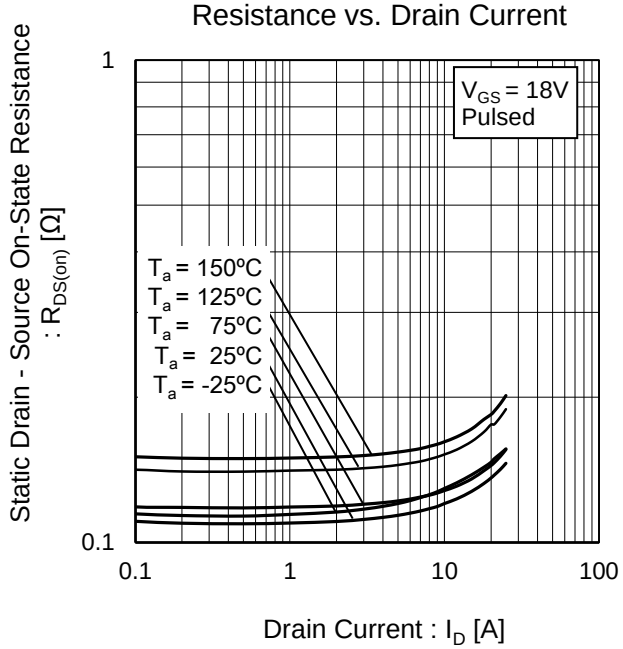


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

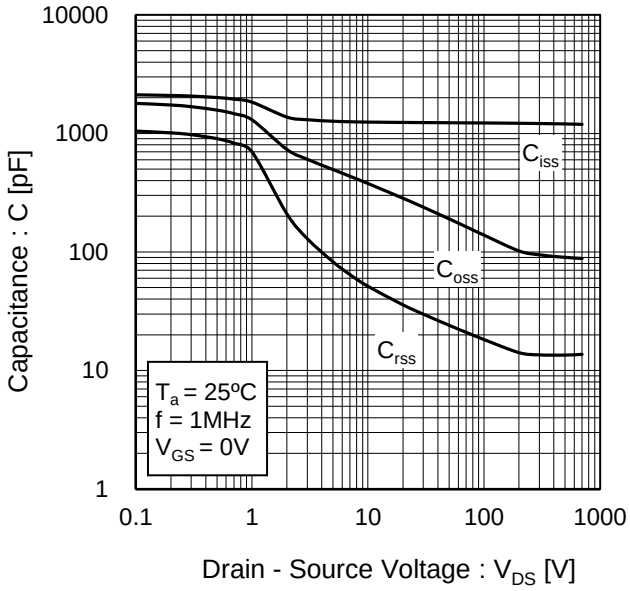


Fig.16 Coss Stored Energy

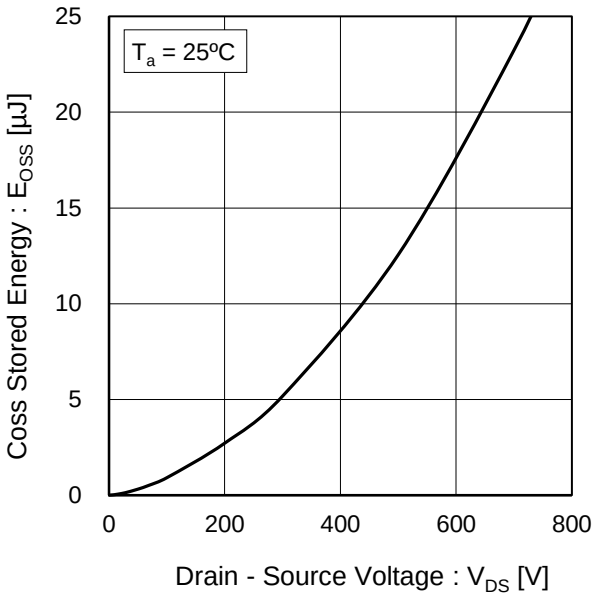


Fig.17 Switching Characteristics

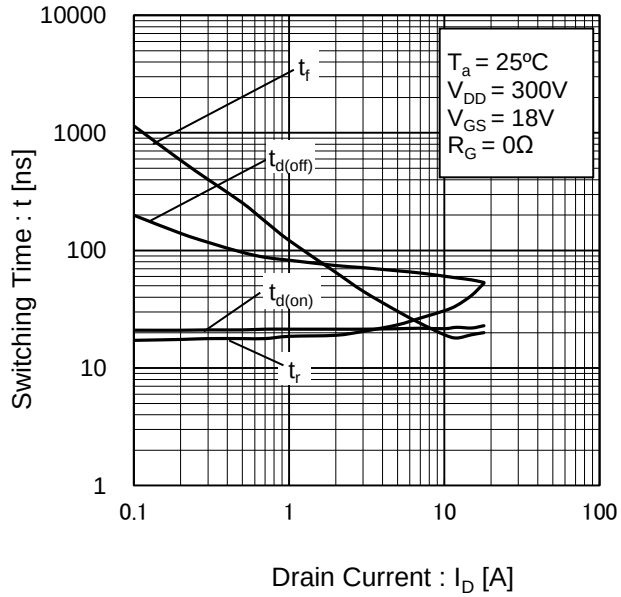
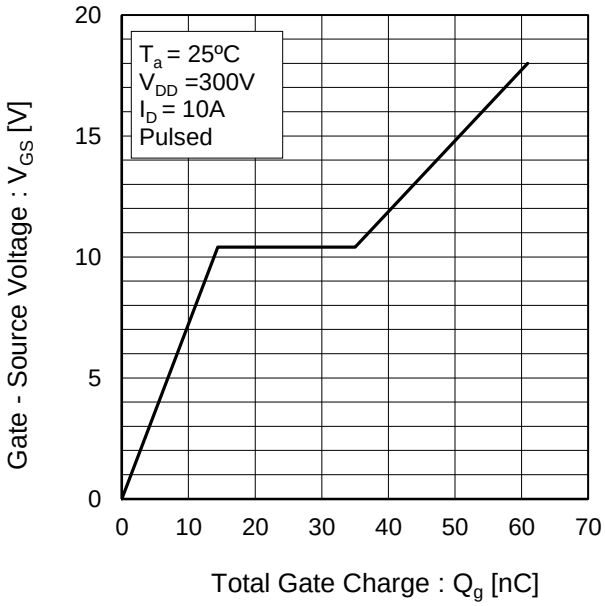


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.19 Typical Switching Loss vs. Drain - Source Voltage

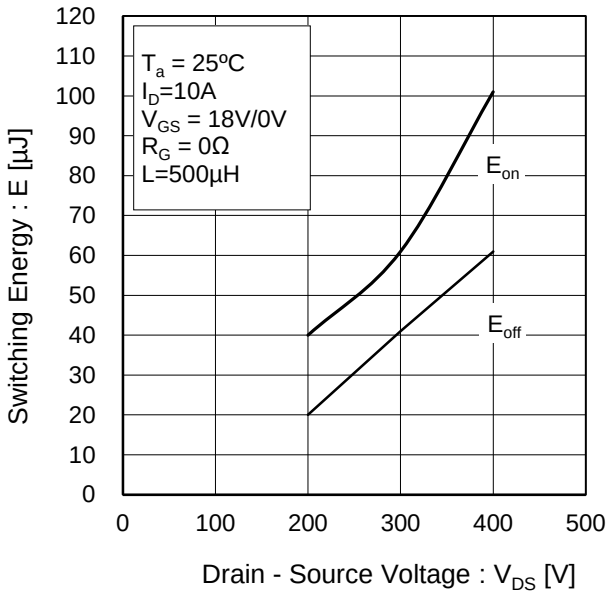


Fig.20 Typical Switching Loss vs. Drain Current

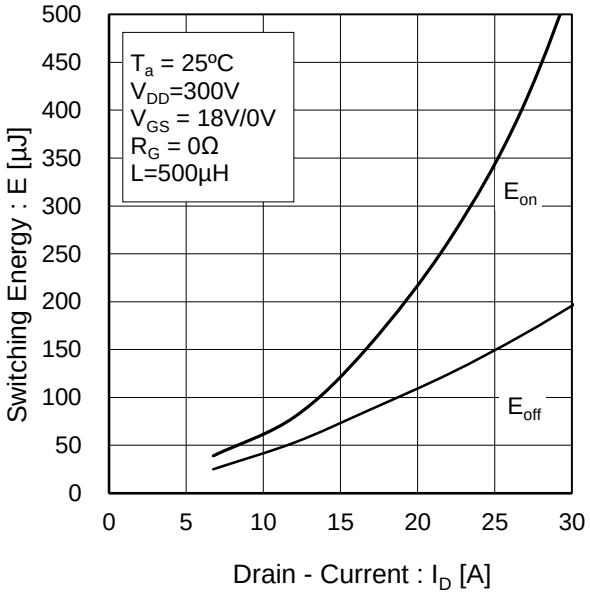
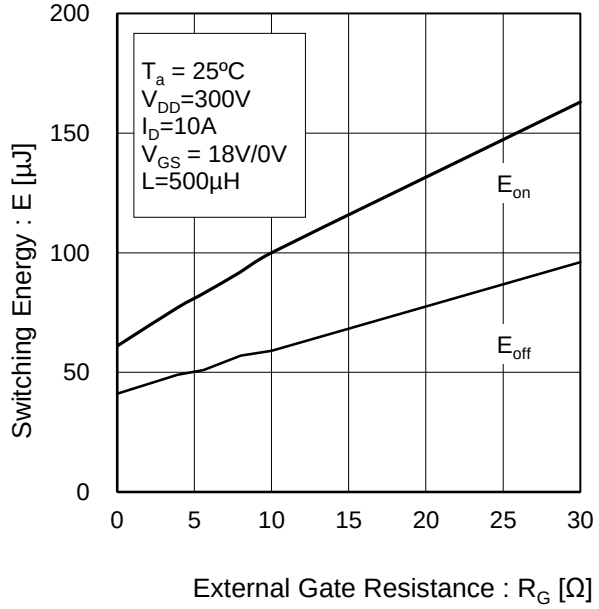


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

Fig.22 Inverse Diode Forward Current vs. Source - Drain Voltage

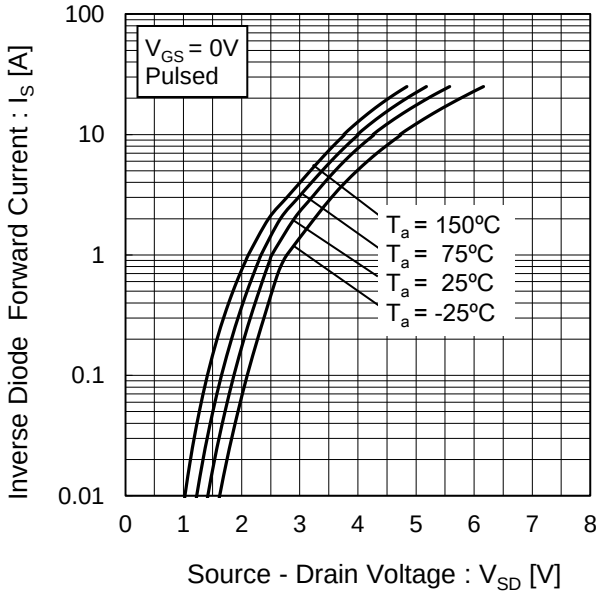
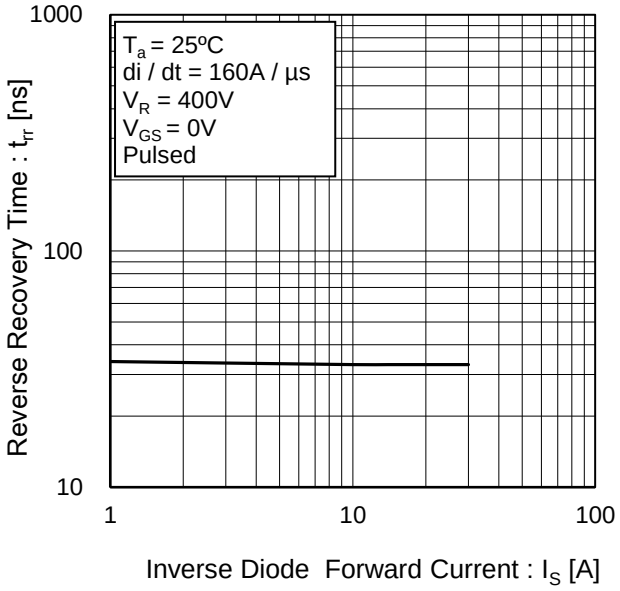


Fig.23 Reverse Recovery Time vs.Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

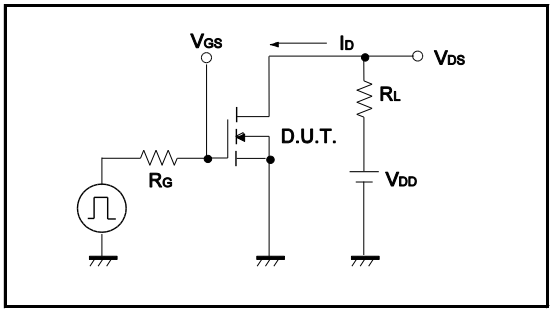


Fig.1-2 Switching Waveforms

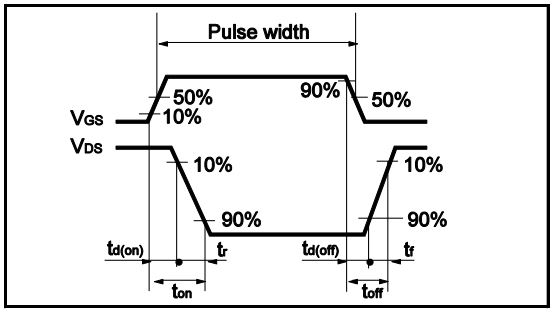


Fig.2-1 Gate Charge Measurement Circuit

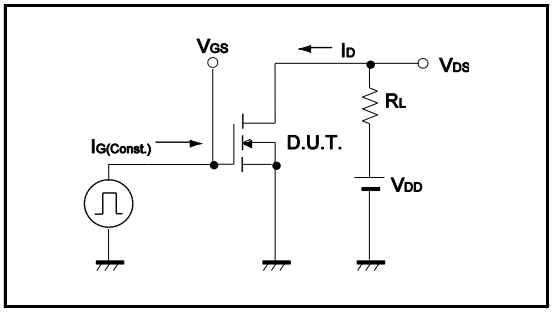


Fig.2-2 Gate Charge Waveform

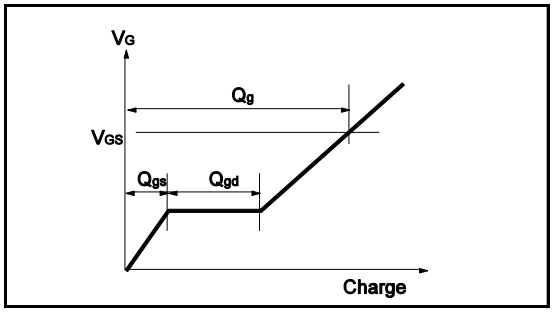


Fig.3-1 Switching Energy Measurement Circuit

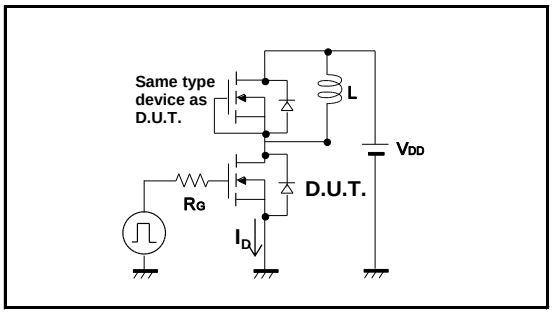


Fig.3-2 Switching Waveforms

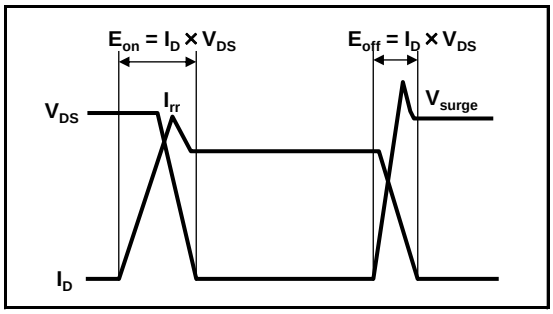


Fig.4-1 Reverse Recovery Time Measurement Circuit

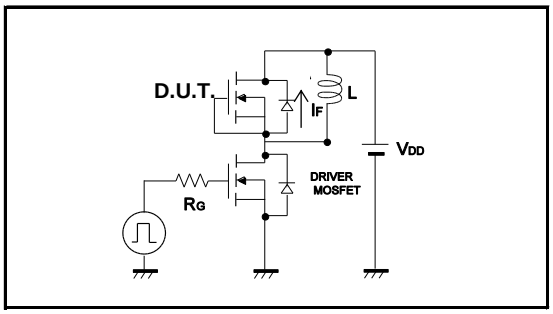
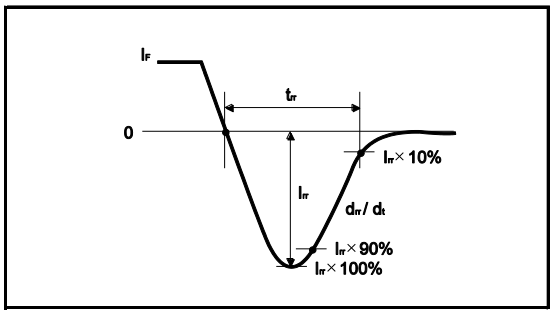
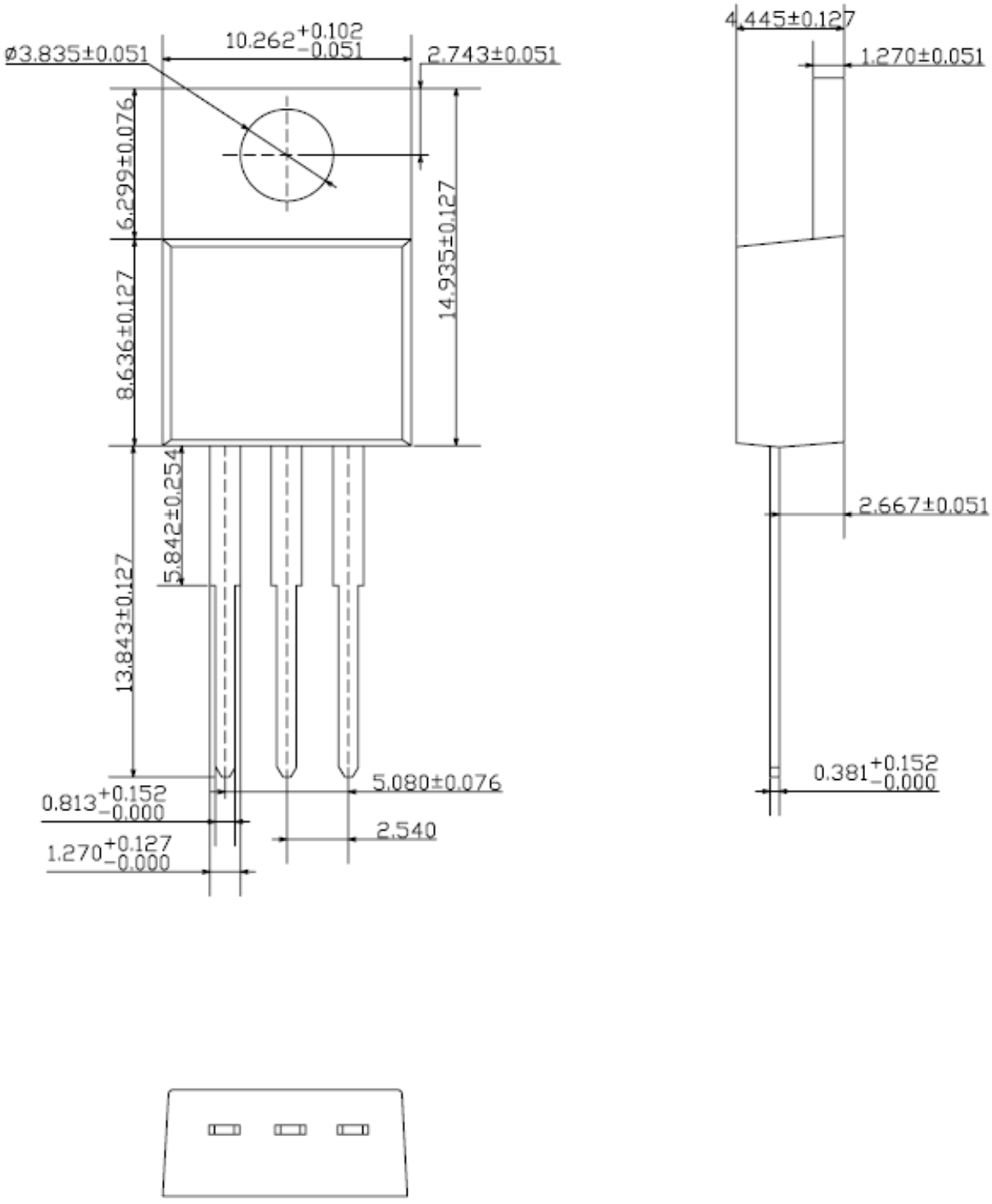


Fig.4-2 Reverse Recovery Waveform



●**Dimensions** (Unit : mm)

TO-220AB



Notes

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3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

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